

From the INTERNATIONAL BUREAU

**PCT**

NOTIFICATION OF TRANSMITTAL  
OF COPIES OF TRANSLATION  
OF THE INTERNATIONAL PRELIMINARY REPORT  
ON PATENTABILITY  
(CHAPTER I OR CHAPTER II  
OF THE PATENT COOPERATION TREATY)  
(PCT Rules 44bis.3(c) and 72.2)

To:

HASEGAWA, Yoshiki  
Soei Patent and Law Firm  
10-6, Ginza 1-chome  
Chuo-ku  
Tokyo, 1040061  
JAPON

Ginza First Bldg.

Date of mailing ( <i>day/month/year</i> ) 02 March 2006 (02.03.2006)	
Applicant's or agent's file reference FP04-0012-00	<b>IMPORTANT NOTIFICATION</b>
International application No. PCT/JP2004/004212	International filing date ( <i>day/month/year</i> ) 25 March 2004 (25.03.2004)
Applicant HAMAMATSU PHOTONICS K.K. et al	

## 1. Transmittal of the translation to the applicant.



The International Bureau transmits herewith a copy of the English translation of the international preliminary report on patentability (Chapter I).



The International Bureau transmits herewith a copy of the English translation of the international preliminary report on patentability (Chapter II).

## 2. Transmittal of the copy of the translation to the designated or elected Offices.

The International Bureau notifies the applicant that copies of that translation have been transmitted to the following designated or elected Offices requiring such translation:

None

The following designated or elected Offices, having waived the requirement for such a transmittal at this time, will receive copies of that translation from the International Bureau only upon their request:

AE, AG, AL, AM, AP, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EA, EC, EE, EG, EP, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OA, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW

## 3. Reminder regarding translation into (one of) the official language(s) of the elected Office(s).

The applicant is reminded that, where a translation of the international application must be furnished to an elected Office, that translation must contain a translation of any annexes to the international preliminary report on patentability (Chapter II).

It is the applicant's responsibility to prepare and furnish such translation directly to each elected Office concerned within the applicable time limit (Rule 74.1). See Volume II of the PCT Applicant's Guide for further details.

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland	Authorized officer  Yoshiko Kuwahara
Facsimile No.+41 22 740 14 35	Facsimile No.+41 22 338 90 90

## PATENT COOPERATION TREATY

## PCT

## INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter I of the Patent Cooperation Treaty)

(PCT Rule 44bis)

Applicant's or agent's file reference FP04-0012-00	FOR FURTHER ACTION		See item 4 below
International application No. PCT/JP2004/004212	International filing date ( <i>day/month/year</i> ) 25 March 2004 (25.03.2004)	Priority date ( <i>day/month/year</i> ) 27 March 2003 (27.03.2003)	
International Patent Classification (8th edition unless older edition indicated) See relevant information in Form PCT/ISA/237			
Applicant HAMAMATSU PHOTONICS K.K.			

1. This international preliminary report on patentability (Chapter I) is issued by the International Bureau on behalf of the International Searching Authority under Rule 44 bis.1(a).

2. This REPORT consists of a total of 5 sheets, including this cover sheet.

In the attached sheets, any reference to the written opinion of the International Searching Authority should be read as a reference to the international preliminary report on patentability (Chapter I) instead.

3. This report contains indications relating to the following items:

- |                                     |              |   |
|-------------------------------------|--------------|---|
| <input checked="" type="checkbox"/> | Box No. I    | Basis of the report   |
| <input type="checkbox"/>            | Box No. II   | Priority  |
| <input type="checkbox"/>            | Box No. III  | Non-establishment of opinion with regard to novelty, inventive step and industrial applicability  |
| <input type="checkbox"/>            | Box No. IV   | Lack of unity of invention  |
| <input checked="" type="checkbox"/> | Box No. V    | Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement |
| <input type="checkbox"/>            | Box No. VI   | Certain documents cited   |
| <input type="checkbox"/>            | Box No. VII  | Certain defects in the international application  |
| <input type="checkbox"/>            | Box No. VIII | Certain observations on the international application   |

4. The International Bureau will communicate this report to designated Offices in accordance with Rules 44bis.3(c) and 93bis.1 but not, except where the applicant makes an express request under Article 23(2), before the expiration of 30 months from the priority date (Rule 44bis .2).

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland  Facsimile No. +41 22 740 14 35	Date of issuance of this report 22 February 2006 (22.02.2006)
	Authorized officer  Yoshiko Kuwahara  Telephone No. +41 22 338 90 90

# PATENT COOPERATION TREATY

Translation

From the  
INTERNATIONAL SEARCHING AUTHORITY

To:

## PCT

WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43bis.1)

<div style="border: 1px solid black; width: 100%; height: 100%;"></div>		<p>Date of mailing (day/month/year)</p>
<p>Applicant's or agent's file reference <b>FP04-0012-00</b></p>		<p><b>FOR FURTHER ACTION</b> See paragraph 2 below</p>
<p>International application No. <b>PCT/JP2004/004212</b></p>	<p>International filing date (day/month/year) <b>25.03.2004</b></p>	<p>Priority date (day/month/year) <b>27.03.2003</b></p>
<p>International Patent Classification (IPC) or both national classification and IPC</p>		
<p>Applicant <b>HAMAMATSU PHOTONICS K.K.</b></p>		

1. This opinion contains indications relating to the following items:

- |                                     |              |  |
|-------------------------------------|--------------|--|
| <input checked="" type="checkbox"/> | Box No. I    | Basis of the opinion   |
| <input type="checkbox"/>            | Box No. II   | Priority   |
| <input type="checkbox"/>            | Box No. III  | Non-establishment of opinion with regard to novelty, inventive step and industrial applicability   |
| <input type="checkbox"/>            | Box No. IV   | Lack of unity of invention   |
| <input checked="" type="checkbox"/> | Box No. V    | Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement |
| <input type="checkbox"/>            | Box No. VI   | Certain documents cited  |
| <input type="checkbox"/>            | Box No. VII  | Certain defects in the international application   |
| <input type="checkbox"/>            | Box No. VIII | Certain observations on the international application  |

2. **FURTHER ACTION**

If a demand for international preliminary examination is made, this opinion will be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

3. For further details, see notes to Form PCT/ISA/220.

<p>Name and mailing address of the ISA/JP</p>	<p>Authorized officer</p>
<p>Facsimile No.</p>	<p>Telephone No.</p>

WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY

International application No.

PCT/JP2004/004212

Box No. 1

Basis of this opinion

1. With regard to the **language**, this opinion has been established on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.  
☐ This opinion has been established on the basis of a translation from the original language into the following language  
\_\_\_\_\_, which is the language of a translation furnished for the purposes of international search (under Rule 12.3 and 23.1(b)).
2. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application and necessary to the claimed invention, this opinion has been established on the basis of:
  - a. type of material  
☐ a sequence listing  
☐ table(s) related to the sequence listing
  - b. format of material  
☐ in written format  
☐ in computer readable form
  - c. time of filing/furnishing  
☐ contained in the international application as filed.  
☐ filed together with the international application in computer readable form.  
☐ furnished subsequently to this Authority for the purposes of search.
3. ☐ In addition, in the case that more than one version or copy of a sequence listing and/or table(s) relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
4. Additional comments:

WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY

International application No.  
PCT/JP2004/004212

Box No. V	Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement		
1.	Statement		
	Novelty (N)	Claims 1-11.	YES
		Claims	NO
	Inventive step (IS)	Claims	YES
		Claims 1-11	NO
	Industrial applicability (IA)	Claims 1-11	YES
		Claims	NO
2.	Citations and explanations:		
	<p>Document 1: JP, 2001-291892, A (HAMAMATSU PHOTONICS K.K.), 19 October 2001 (19.10.01)</p> <p>Document 2: JP, 2003-66150, A (CANON INC.), 05 March 2003 (05.03.03)</p> <p>Document 3: WO, 01/51950, A1 (HAMAMATSU PHOTONICS K.K.), 19 July 2001 (19.07.01)</p> <p>Document 4: JP, 5-121711, A (NEC CORPORATION), 18 May 1993 (18.05.93)</p>		
	<p><u>Claims 1, 3, 10</u></p> <p>Document 1 (Figs. 1-3 and their explanatory portions) discloses an invention that forms photodiodes in an array form on the surface opposite the surface at which light enters a semiconductor substrate and provides a scintillator 2 at the surface at which light enters a semiconductor substrate.</p> <p>Also, documents 2 and 3 disclose technology that provides a resin at the surface at which light enters a substrate and that provides a scintillator thereon. In the invention described in document 1 too, providing a resin at the surface at which light enters a substrate and providing a scintillator thereon could easily be achieved by a person skilled in the art.</p>		
	<p><u>Claim 2</u></p> <p>Document 4 (Fig 1 and its explanatory portions) discloses an invention that provides a hole 6 in the surface opposite the surface at which light enters a substrate and that provides a photosensitive part in the bottom of the hole 6. Employing this technology in the invention described in document 1 could easily be achieved by a person skilled in the art.</p>		
	<p><u>Claims 4, 5</u></p> <p>Document 1 (Figs. 1-3 and their explanatory portions) describes providing a channel stop layer 6 between photodiodes. It also describes providing an N<sup>+</sup> diffusion layer 8 of the same conductivity type as a semiconductor substrate at the surface at which light enters a semiconductor substrate.</p>		

Supplemental Box

In case the space in any of the preceding boxes is not sufficient.

Continuation of Box V.2:

Claims 6, 11

Document 1 (Figs. 1-3 and their explanatory portions) discloses a step that provides  $P^+$  diffusion layers 4 and 5 on one surface of an N-type semiconductor substrate 3, and a step that provides a scintillator on the other surface.

Also, documents 2 and 3 disclose a step that provides a resin on the surface at which light enters a substrate and that provides a scintillator thereon. In the invention described in document 1 too, providing a resin at the other surface and providing a scintillator thereon could easily be achieved by a person skilled in the art.

Claim 7

Document 4 (Fig 1 and its explanatory portions) discloses a step that provides a hole 6 in the surface opposite the surface at which light enters a substrate and a step that provides a photosensitive part in the bottom of the hole 6. Employing this technology in the invention described in document 1 could easily be achieved by a person skilled in the art.

Claims 8, 9

Document 1 (Figs. 1-3 and their explanatory portions) appears to disclose an invention that provides an  $N^+$  diffusion layer 8 at the other surface of a semiconductor substrate and then provides a scintillator. Also, document 1 describes a step that provides an  $N^+$  channel stop layer 7 between  $P^+$  diffusion layers 4 and 5.